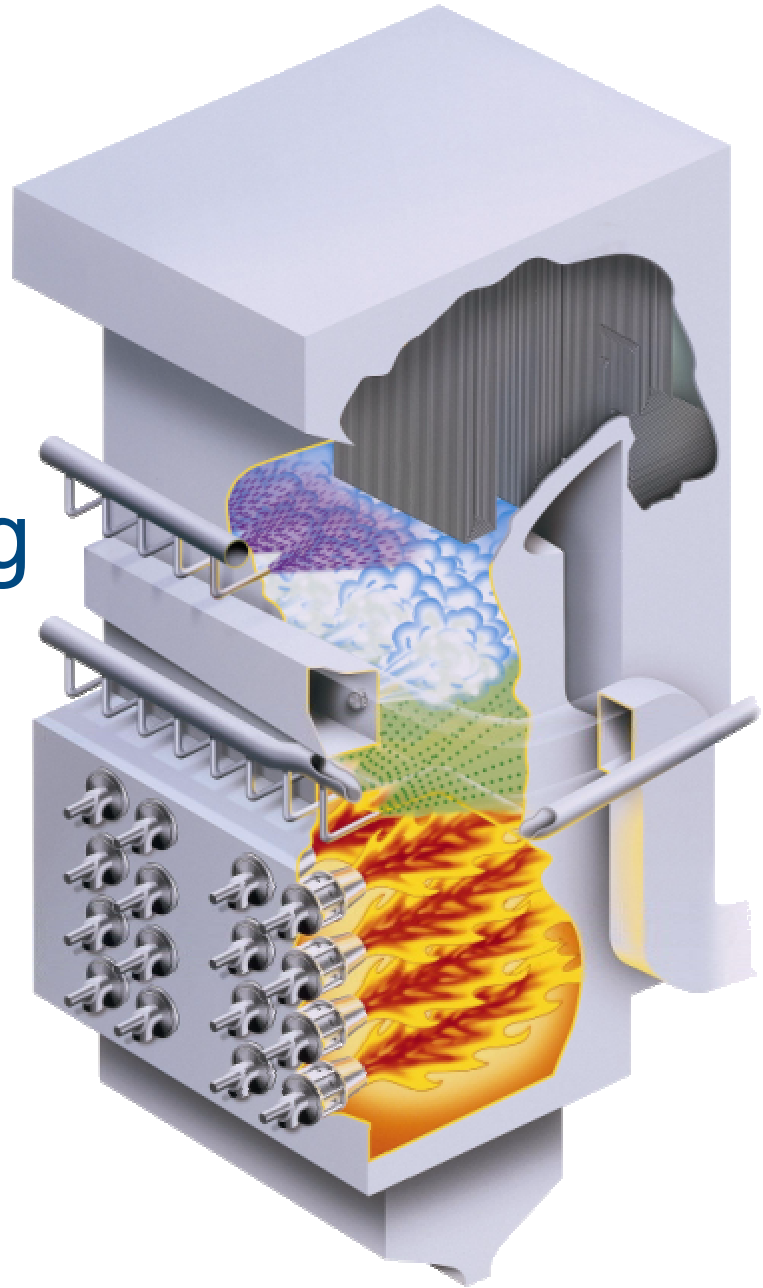
Mercury Control Using Combustion Staging

Vitali Lissianski

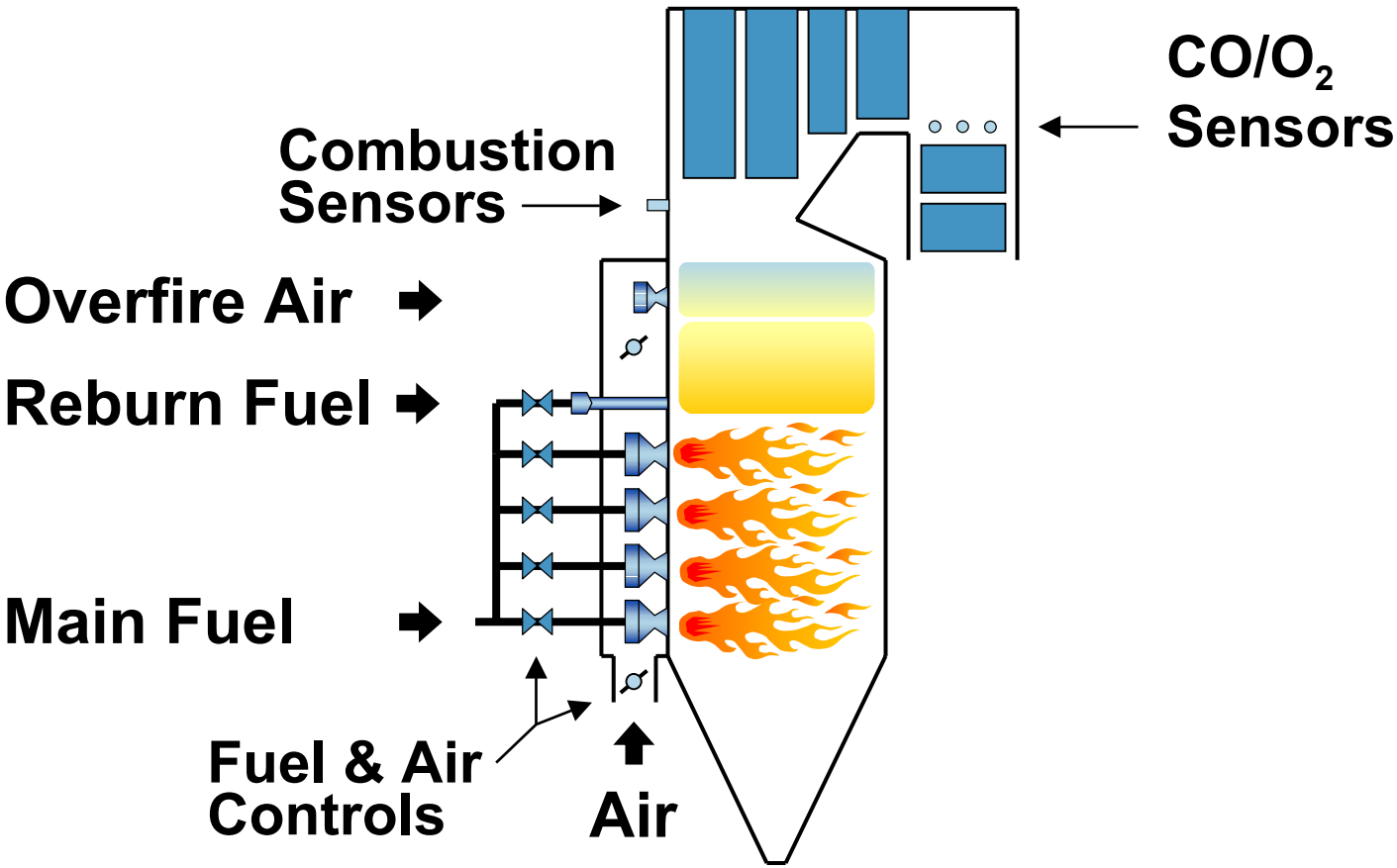
DOE NETL Conference on Reburning for NOx Control

Morgantown, West Virginia

18 May 2004



What are combustion optimization & combustion modifications?



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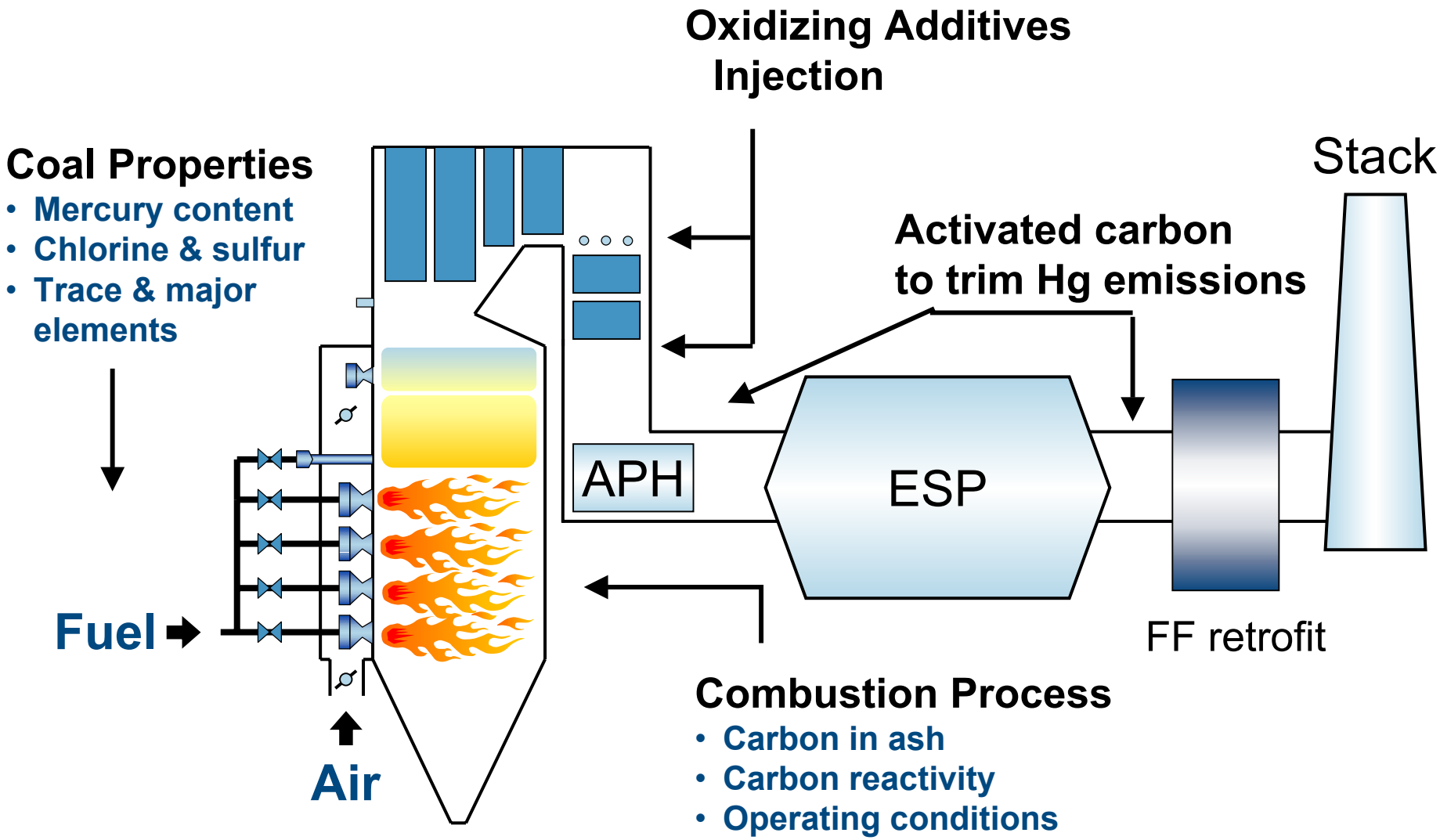
GE's approach to mercury control



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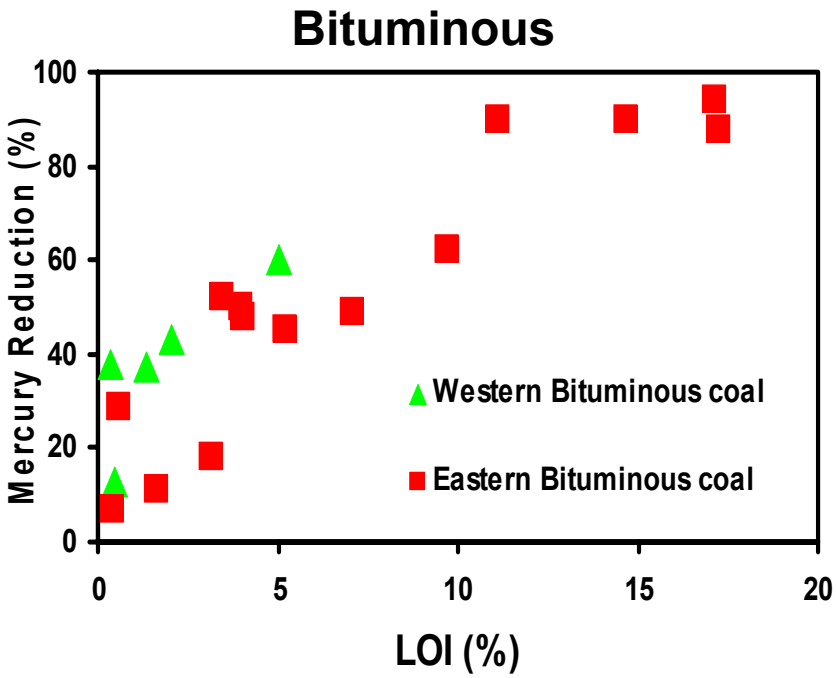
What differentiates GE's approach?

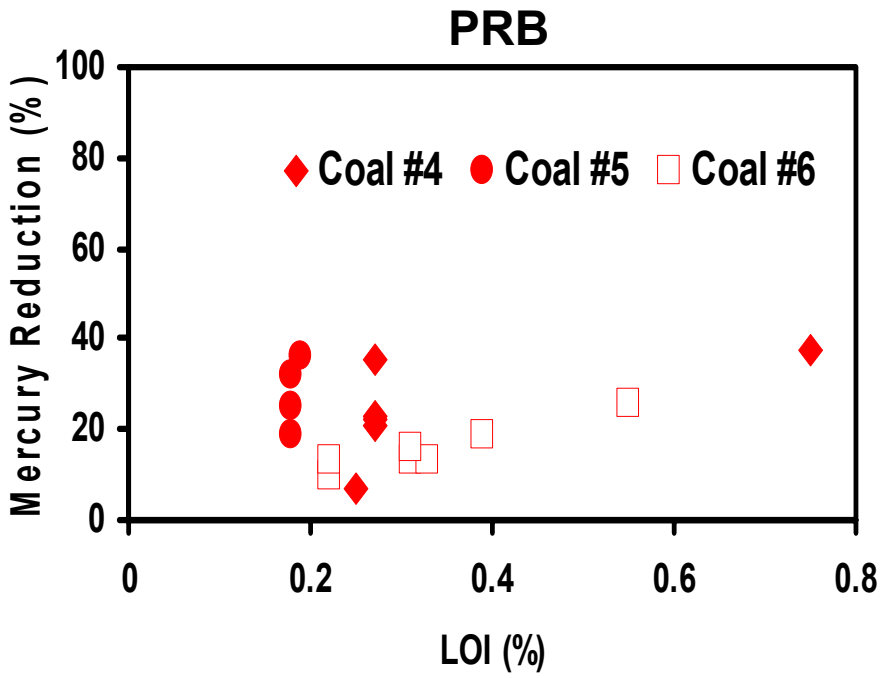
- **Tailored to plant configuration**
  - Coal type
  - Particulate control device (ESP, FF)
  - SO_2 control
  - NO_x control
- **Integrated approach to mercury control**
  - Combustion modifications/combustion optimization
  - Additives to oxidize mercury and improve NO_x control
  - Activated carbon injection
- **Reduced cost of mercury control**
- **Improved boiler operation**
  - Improved plant reliability
  - Reduced NO_x emissions

Pilot-scale tests were conducted to identify optimum conditions

- Boiler Simulator Facility ($1x10^6$ Btu/hr, 300kW)
- Simulation of combustion conditions and time-temperature profile in full-scale utility boiler
- Test variables include combustion conditions, coal type, and coal blending
- Continuous mercury measurements

Effect of coal type





- Higher Cl content in Bituminous coal
- Bituminous coals generate higher LOI fly ash
- Extend of mercury oxidation is more significant for Bituminous coals

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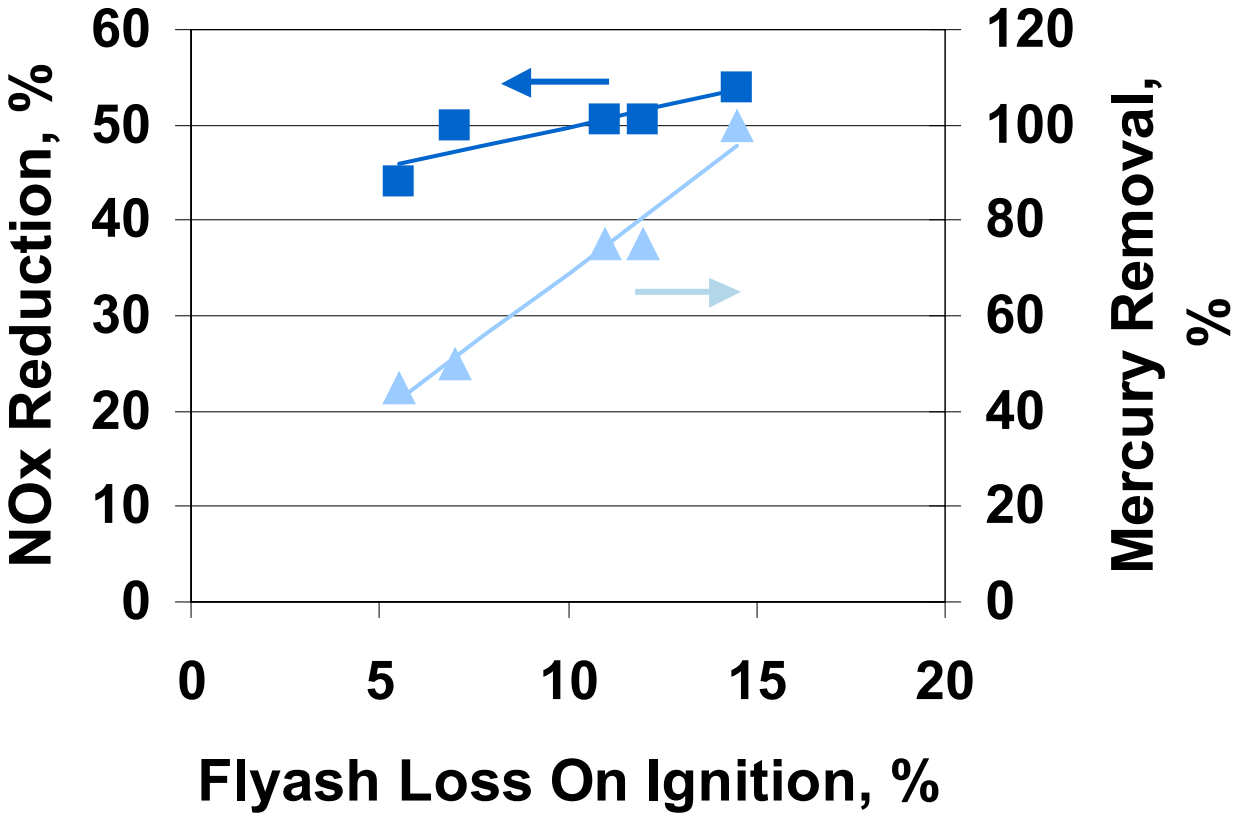
Coal reburn is effective in reducing both NOx and Hg emissions



EER Pilot-Scale Data

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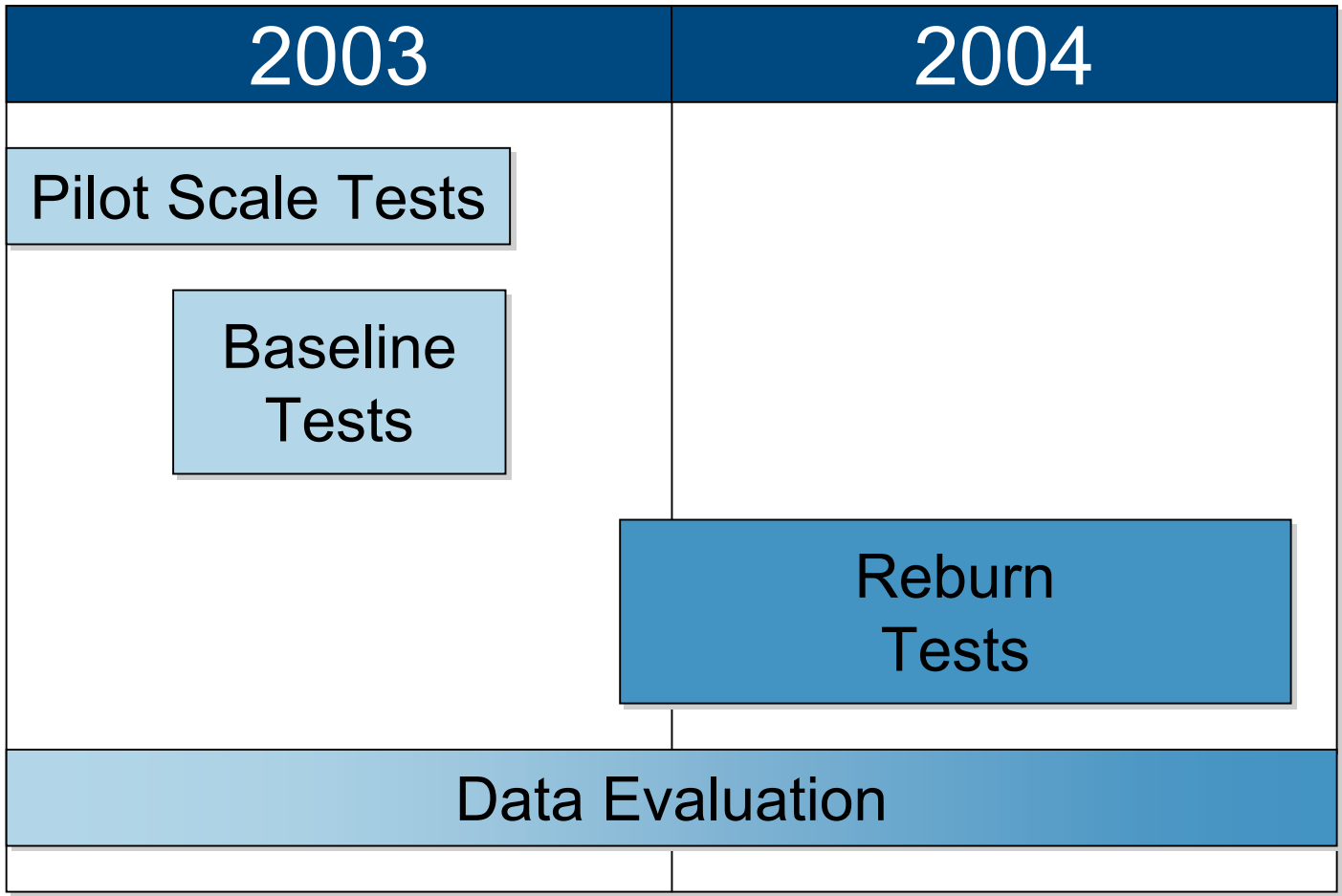
Demonstration of CO/CM for Hg control using bituminous coal



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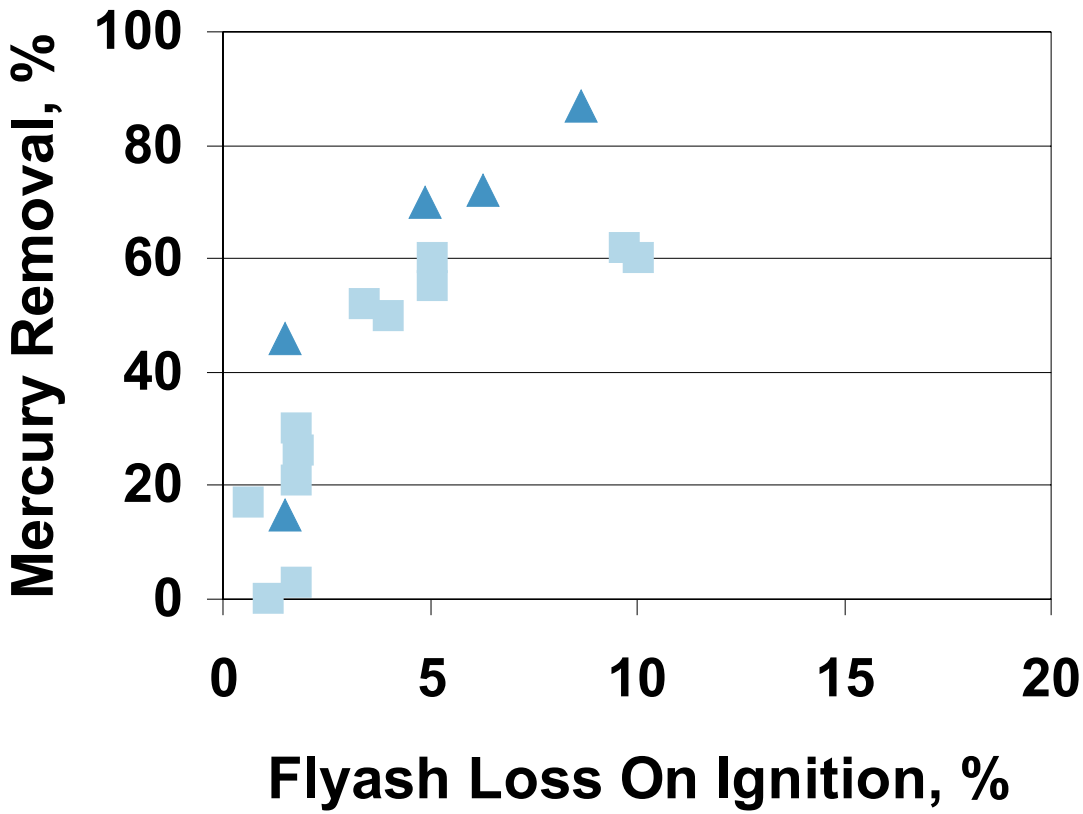
Pilot-scale results show potential for CO/CM to improve Hg removal



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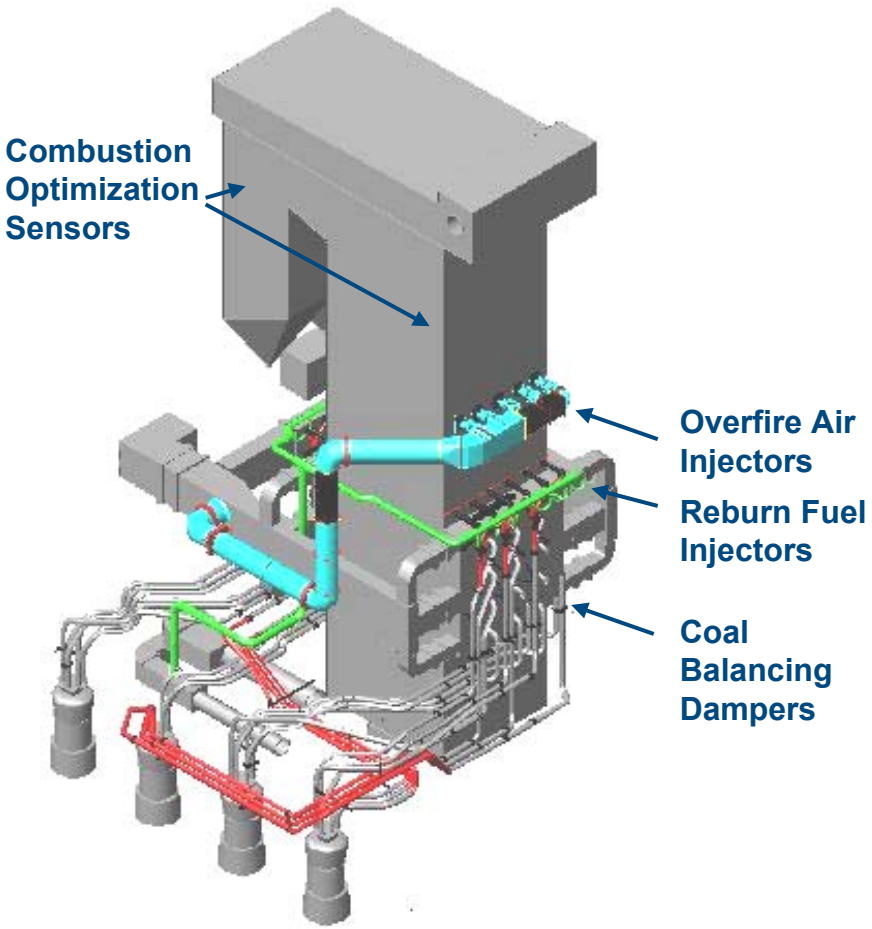
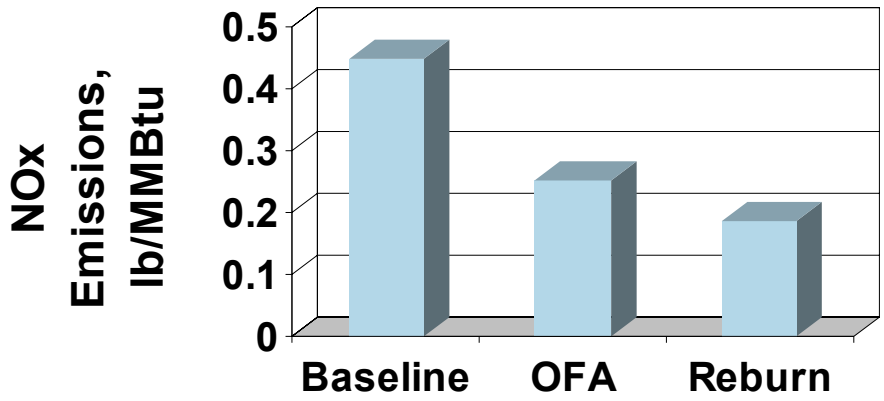
Host site is equipped with a coal reburn system for NOx emissions control





- Capacity: 250 MW
- Fuel: Bituminous coal
- System: Coal reburn system, coal dampers, combustion sensors, cold-side ESP, & wet scrubber

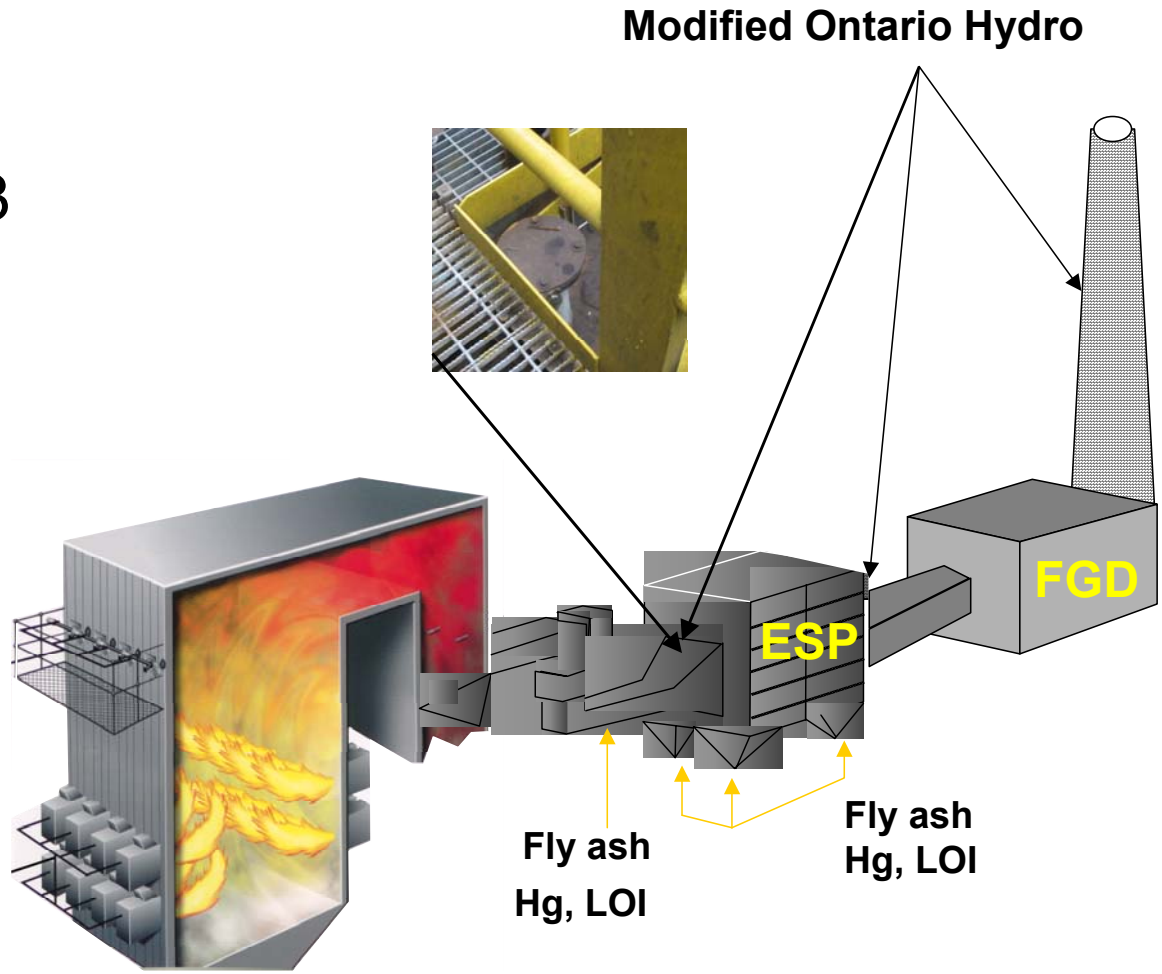
Baseline Hg tests were performed to characterize system performance

Test Period
- > 9/28/03 – 10/2/03

Hg Measurements
- > ESP inlet
- > ESP outlet
- > Stack

Fly Ash Sampling
- > Economizer
- > ESP hoppers

Coal Sampling
- > Mill bunkers



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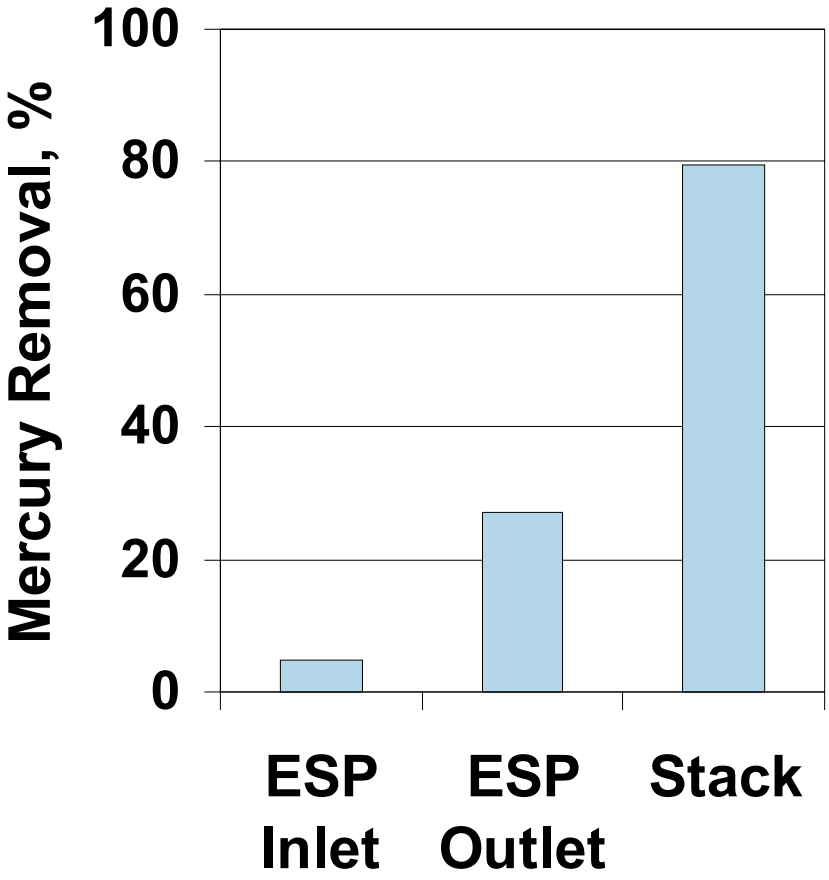
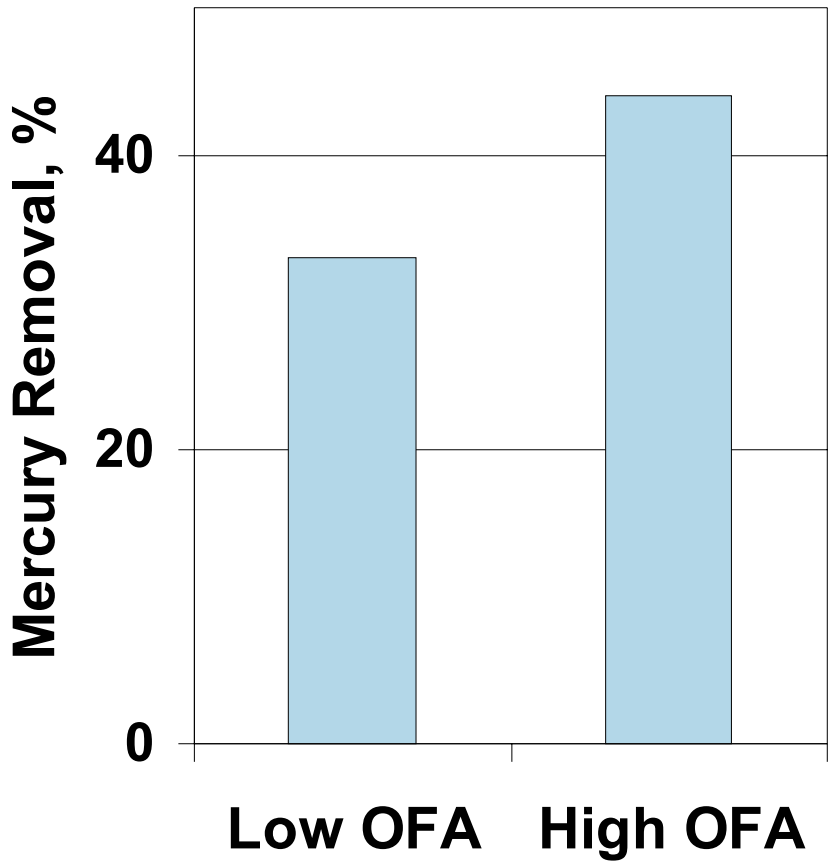
Baseline results in agreement with expected performance





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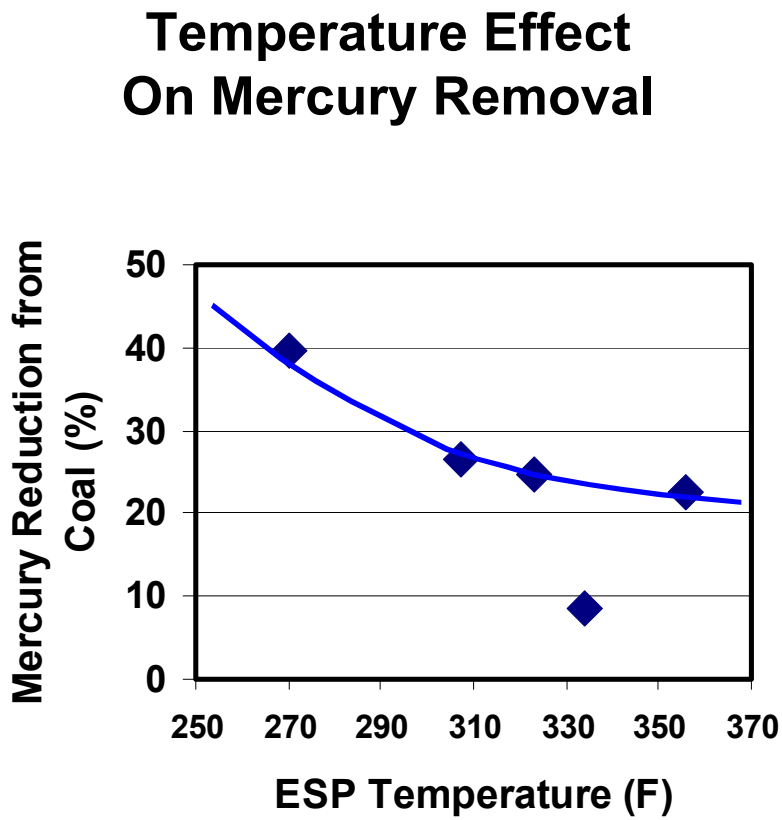
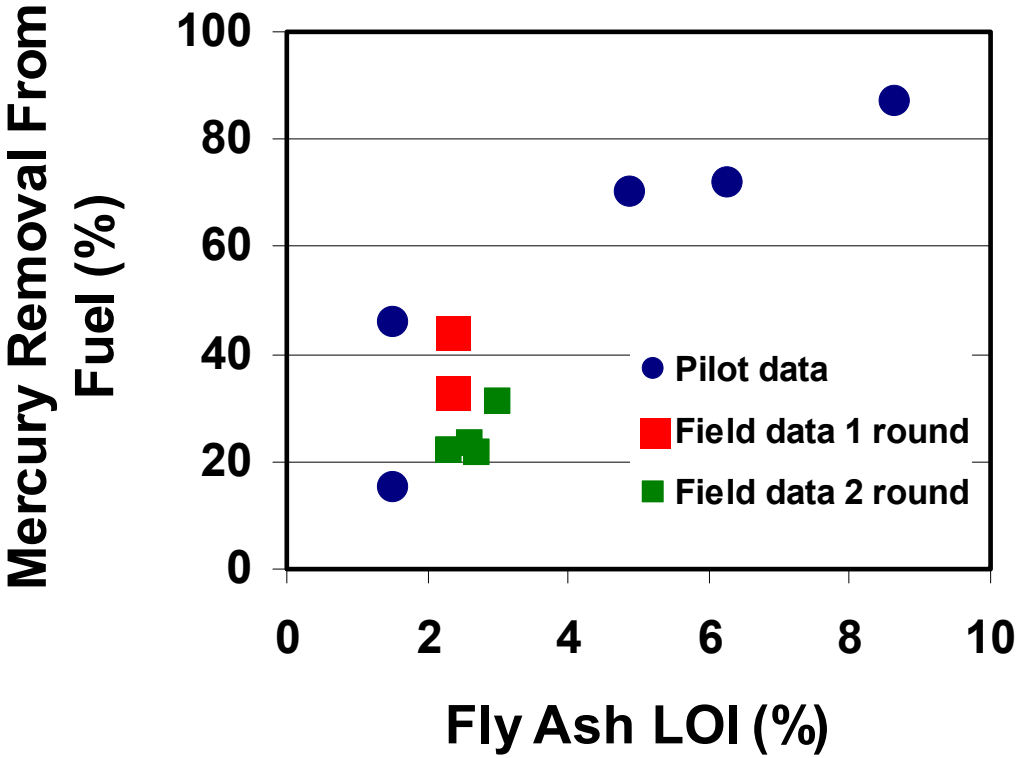
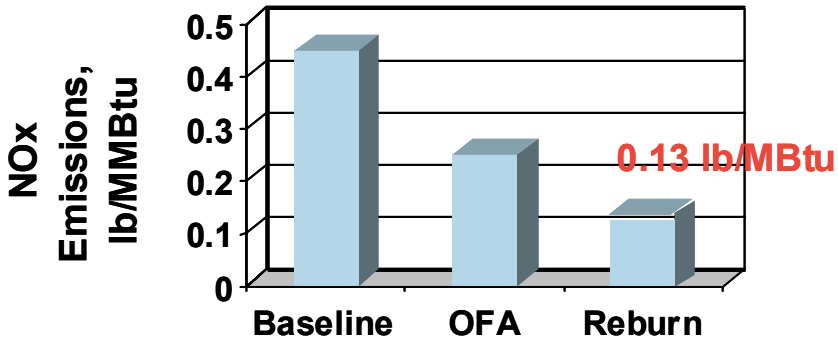
Second round of mercury testing

- January 2004
- In conjunction with reburn optimization
- Minimization of NO_x emissions and LOI
- ESP inlet and outlet, stack



Comparison of test results is good and indicates performance can be improved





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Summary

- Combustion modifications and optimization – available and proven
- GE approach will reduce NO_x and CO emissions, improve plant reliability and heat rate while providing mercury control
- GE mercury solution is tailored to plant configuration
- Cost of mercury control using GE approach is lower than that of activated carbon injection

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